2.0 REMOVE POWER CORD ASSEMBLY (Refer to DWG 86604-2)

2.1 Open Main PC Board and disconnect positive (red) battery wire from battery terminal

2.2 Remove the HEYCO strain relief (Item 9) utilizing HEYCO pliers.

2.3 Remove the heat shrink covering the solder connection where the power cord's white wire is soldered to the transformer.

2.4 Desolder the power cord's white wire at the transformer.

2.5 Remove nut (Item 17), lock washer (Item 18), ring terminal (Item 19, connected to green wire) and star washer (Item 10) from the grounding stud on the inside of back panel.

2.6 Utilizing diagonal cutters, cut the power cord's remaining black wire approximately 3 inches form the AC fuse holder (Item 11).

2.7 Pull the power cord assembly from the pump and discard.

3.0 INSTALL POWER CORD ASSEMBLY (Refer to DWG 86604-2)

NOTE: Power cord part number 86064P is pre-assembled with a strap and insulation is stripped to length.

3.1 Install the power cord through the oval opening in the back panel (Item 1).

3.1.1 Place the HEYCO strain relief (Item 9) over the power cord at the end of the power cord's gray casing. Leave up to $^{1}/_{8}$" of the casing beyond the edge of the strain relief.

3.1.2 Utilizing the HEYCO pliers squeeze the strain relief and insert into the oval opening in the back panel.

3.2 Route the black, white and green power cord wires between the battery and the back panel (Item 1).

CAUTION: AC wires must be routed away from the DC circuits on the Main PCB assembly in order to prevent interference from electromagnetic fields.

3.3 Secure black AC wire.

3.3.1 Strip $^{3}/_{8}$" of the insulation, twist and tin the existing wire from the AC fuse holder (Item 11).

3.3.2 Place two pieces of clear $^{3}/_{16}$" x ¾" long heat shrink over the black power cord wire.

NOTE: Mechanically secure both black wires prior to soldering.

3.3.3 Bend loops in the tinned areas of both black wires, hook together and solder.

3.3.4 Center the first piece of heat shrink over the solder connection and shrink with a heat gun.

3.3.5 Center the second piece of heat shrink over the solder connection and shrink with a heat gun.

3.4 Secure the white AC wire.

3.4.1 Place a piece of clear $^{3}/_{16}$" x ¾" long heat shrink over the white power cord wire.

3.4.2 Bend a loop in the tinned area of the white wire.

3.4.3 Insert the hook of the white wire into the vacant loop on the left side of the transformer and solder.

3.4.4 Slide the heat shrink over the solder connection and shrink with a heat gun.

3.5 Secure the green AC wire.

3.5.1 Place star washer (Item 10) on ground stud on the back panel (Item 1)

3.5.2 Place the ring terminal (Item 19, connected to the green AC wire) on the stud.

3.5.3 Place a lock washer (Item 26) on the stud.

3.5.4 Place an $^{11}/_{32}$" nut (Item 17) on the stud and tighten.

4.0 REASSEMBLE PUMP (Refer to DWG 86600-3)

4.1 Check for loose or foreign objects within the unit.

1.2 Connect battery; tuck harness wire correctly (away from pump assembly and AC voltage wires, then close Main PCB).

1.3 Align openings in chassis sticker in the standoffs in the top plate and press down. Pull sides of the sticker down sides of chassis, align with edge of back and front panels, press down and fold the rest of the sticker on to bottom plate.

NOTE: Replace the chassis sticker if damaged, or if it appears that it may not prevent fluid intrusion.

1.4 Place finished case (Item 7) over sub-assembly final. Align the holes in the case with standoffs in the top and bottom plates. Attach case with (4) 8-32 x $^{3}/_{16}$ (Item 10) and (4) external tooth star washers (Item 11). Squeeze bottom of case together while tightening screws.

1.5 Attach handle (Item 8) to case with (2) 8-32 x 1 ¼ screws (Item 12).

5.0 OPERATIONAL CHECK

5.1 Perform the Preventative Maintenance inspection which is located in the Service Manual.

6.0 TECHNICAL ASSITANCE

6.1 For technical assistance, please call the SIGMA Service Manager at 1-800-356-3454.

Field Service Bulletin FSB 93-004 – Time Keeper RAM Maintenance (Battery Backed RAM)

PURPOSE: This procedure is intended to provide the User Facilities with a chronological sequence of steps required to evaluate and replace the Timekeeper RAM (RAM) if necessary (reference SIGMA P/N 81530).

SCOPE: The application of this procedure is limited to biomedical technicians. RAM IC's should be replaced whenever they are malfunctioning or damaged. SIGMA Standard Operating Procedures (SOP) shall supersede any applicable step of this procedure.

REFRENCE PROCEDURES:

SIGMA Service Bulletin 92-001
SIGMA 6000+ Programmable Special Software Feature Operators Instructions
SIGMA 6000 IV Pump Preventative Maintenance

REFERENCE DRAWINGS:

SIGMA DWG #	Description
86600 – 3	Final Assembly
86626	Assembly Main PCB (pg 2 of 2)

MATERIALS REQUIRED:

SIGMA P/N	Description
N/A	Flux Core Solder, (60/40 tin/lead, type RMA)
N/A	Electrowash or non-alcohol based flux remover

TOOLS REQUIRED:

Straight-slot Screwdriver
Diagonal Cutters
Solder Iron (35-45w)
Desoldering Device

THEORY OF OPERATION:

When unit power (Vcc) is applied and the unit is powered up the Time Keeper RAM (RAM) operates as a conventional static RAM. When the unit is ON, and during SLEEP MODE (three hours after the unit is turned OFF) the RAM is refreshed utilizing the regulated 5vdc supply (Logic 5vdc). The RAM has a self-contained lithium battery utilized to maintain data (nonvolatile memory) when unit power is removed. Should the supply voltage decay or be removed the RAM will automatically powerfail deselect and switch to the RAM battery back up.

The life of the RAM battery is directly proportional to the units Power On duty cycle (i.e. if the unit duty cycle increases, the RAM battery life increases). Through product developments the manufacturer has increased the RAM battery life from 3.3 years at 0% Vcc duty cycle to 3.7 years. RAMs currently being installed are expected to last approximately 5years at 25% Vcc duty cycle. For all practical purposes the RAM battery decay begins at initialization of the pump. Starting the RAM oscillator during initialization is performed during Electronic Calibration at the SIGMA factory.

Field Service Bulletin FSB 93-004 – Time Keeper RAM Maintenance (Battery Backed RAM) (Continued)

Upon power-up of the unit, a software flag is checked internal to the RAM. Should this flag be set, it has indicated a failure of the RAM's batter back up (depleted below a certain level). The present software will not allow the pump to start once this flag has been set. As a result the "BAD RAM" message is displayed. In the event of a RAM battery back up failure while the pump is operating, the pump will continue to operate normally because the RAM is utilizing supply voltage (Vcc). The RAM battery back up failure will be detected the next time the pump is powered up by displaying a "BAD RAM" message.

NOTE: A "BAD RAM" message does not always indicate that the RAM battery back up has depleted below the operational level. The primary cause of the "BAD RAM" message is user neglect of the pump's battery, or routine service. Refer to SIGMA Service Bulletin 92-001.

"BAD RAM" MESSAGE:

Upon power-up of the pump a test of the validity of the data stored in the RAM is performed by the software. This is done in the form of a checksum. If the checksum does not match the checksum previously stored in the RAM the "BAD RAM" message will be displayed and the pump will not be allowed to start. This check encompasses all of the user set parameters critical to proper operation of the pump. This includes the programmable options, primary, piggyback and programmable mode parameters.

"BAD RAM" messages can be cleared in the event that the "BAD RAM" message was generated as a result of user neglect of the pump's battery or routine maintenance.

CLEAR "BAD RAM" MESSAGE

Test mode activation is accomplished by performing the following steps:

CAUTION: **NEVER OPERATE THE INFUSION PUMP IN THE TEST MODE WHEN THE IV TUBING IS INSTALLED IN THE PUMP AND A PATIENT IS CONNECTED TO THE ADMINISTRATION SET!**

PRIMARY OPERATION AND PIGGYBACK OPERATION SETTING, LIMITS AND TOTALS WILL BE CLEARED DURING THE TEST MODE ACTIVATION.

NOTE: The unit's 12v battery should have been restored to a full charge state through an overnight charge cycle.

1. The pump must be TURNED OFF. (The display should not be illuminated except perhaps the AC charge indicator).
2. Depress and release the ON/OFF key while at the same time HOLDING DOWN the numeric 9 key.
3. When the software program signature is displayed RELEASE the 9 key.
4. The display will now read "TEST MODE".
5. Depress and release the ON/OFF key and the pump will turn off.
6. Verify the pump has cleared the "BAD RAM" message by depressing the ON/OFF key again. The pump should turn on, display "8888 8888" and go into normal operational mode without the "BAD RAM" malfunction message appearing.

NOTE: If a "BAD RAM" message is encountered remove the pump from service and contact the SIGMA Service Department at 1-800-356-3454

7. Verify your facilities desired programmable options. Refer to the "SIGMA 6000+ Programmable Special Software Feature Operators Instructions" for access to the options. SIGMA publishes two versions of this procedure; make note to the applicable software.
8. If the pump was previously utilized in the PROGRAMMABLE MODE of operation, clear and re-program the parameters.

RAM MAINTENANCE:

If the RAM is malfunctioning, damaged or is being replaced as preventative maintenance, refer to the following procedure.

CAUTION: This equipment contains parts sensitive to damage by ELECTROSTATIC DISCHARGE (ESD). Use ESD precautionary procedures when touching, removing or inserting.

WARNING: Remove AC power and re-apply only as directed by this procedure.

1.0 REMOVE CASE (Refer to DWG 86600 – 3)

1.1 Remove (2) 8-32 x 1 ¼" screws (Item 12) from pump handle (Item 8).
1.2 Remove (4) 8-32 x $^{3}/_{16}$" screws (Item 10) and (4) external tooth star washers (Item 11) from the bottom of case.
1.3 Remove finished case (Item 7) from chassis assembly.
1.4 Very carefully remove the chassis sticker (sealing bag) (Item 5) from chassis, start from bottom plate on the Main PCB side. Peal bag up to the top plate assembly only.

2.0 REMOVE RAM IC (Refer to DWG 86626 pg 2 of 2)

2.1 Position pump on its face with the Main PCB opened toward you.
2.2 Locate the RAM (U23)
2.3 Utilizing diagonal cutters cut each pin of the RAM.
2.4 Position pump upright with open Main PCB towards you.
2.5 Utilizing a desoldering device, individually heat each pad from the trace side (outside) of the PCB while simultaneously removing the corresponding pin on he component side (inside) of the PCB. Desolder after pin is removed.
NOTE: Account for all removed pins to prevent possible short circuits while pump is in use.
2.6 Repeat previous step unit all 24 pins are removed.
2.7 Clean pad area from foreign objects and solder flux with an Electrowash.
2.8 Inspect integrity of the pads and connecting traces before installing the replacement RAM.

3.0 INSTALL RAM IC

NOTE: Make sure that the RAM being installed was issued for the corresponding pump. Non-compatible software will result in a BAD RAM condition. Each RAM will be shipped with a Field Maintenance Action Form indicating the S/N of the pump that the RAM was initialized for.

3.1 Position the RAM so that the dot indicating pin 1 is at the top left.
3.2 Push RAM pins through the PCB pads so that the RAM sets flush to the PCB surface.
3.3 Inspect the trace side of PCB to ensure all 24 pins are through.
3.4 Utilizing a soldering iron and solder, solder the 24 pins.
3.5 Trim the exposed RAM pins flush to the pads on the trace side of the PCB.
3.6 Clean foreign objects and solder flux from the trace side of the PCB with Electorwash.

4.0 RAM CHECK

4.1 Re-connect the red battery cable to the positive battery terminal.

4.2 Press and release the ON/OFF key. The pump should display "8888 8888", followed by "BAD RAM" and then shut down.

4.3 Perform all steps of the "CLEAR BAD RAM MESSAGE" section of this bulletin.

5.0 REASSEMBLE PUMP (Refer to DWG 86600 – 3)

5.1 Check for loose or foreign objects within the unit.

5.2 Connect battery, tuck harness wire correctly (away from pump assembly and AC voltage wires) then close Main PCB.

5.3 Align openings in chassis sticker with the standoffs in the top plate and press down. Pull sides of the sticker down sides of the chassis, align with edge of back and front panels, press down and fold the rest of the sticker on to bottom plate.

NOTE: Replace the chassis sticker if damaged or if it appears that it may not prevent fluid intrusion.

5.4 Attach handle (Item 8) to case with (2) 8-32 x 1 ¼ screws (Item 12).

6.0 OPERATIONAL CHECK

6.1 Perform SIGMA's Preventative Maintenance inspection.

FACTORY ASSITANCE:

To place an order for a replacement RAM IC, call Customer Service at 1-800-356-3454. The serial number and the software version (EPROM signature) of the affected pump must be provided.

Part Number	Description	Price
81530	Timekeeper RAM	$11.75

For **technical assistance,** please call the SIGMA Service Manager at 1-800-356-3454.

For **Factory Service** you must obtain a Return Authorization Number (RA#) by calling the SIGMA Service Manager at 1-800-356-3454.

Factory Service Includes:

Complete System Evaluation
Service Effective Upgrades (free parts)
Electronic Calibration
Battery Life Test
Air/Occlusion Calibration
Flow Rate Calibration
Free Return Shipping

Factory Service Costs: $150.00 plus parts

Field Service Bulletin FSB 93-006 – Kit P/N 85207 Installation Procedure (Power Cord Pigtail Strain Relief)

PURPOSE: This procedure is intended to provide the User Facilities with a chronological sequence of steps required to install a pigtail strain relief (SIGMA option kit P/N 85207) to the power cord assembly.

SCOPE: The application of this procedure is limited to biomedical technicians who have satisfactorily completed the SIGMA 2-day or 5-day Service School training class. The pigtail strain relief is an optional upgrade and is to be installed when desired by the User Facility. This style strain relief may provide additional cord support as compared to the originally used strain relief. SIGMA Standard Operating Procedures (SOP) shall supersede any applicable step of this procedure.

REFERENCE MATERIAL:

SIGMA Service Manual 6000
SIGMA Service Manual 6000+
SIGMA Service Manual 6000+ Programmable
SIGMA 6000 IV Pump Preventative Maintenance
SIGMA Field Service Bulletin 93-003

MATERIALS REQUIRED:

SIGMA P/N	Description
85207	Pigtail retrofit upgrade kit
N/A	Shrink tubing, $^{3}/_{16}$" ID, clear, 600v, 125c (ALPHA, FIT 221 or equivalent)
N/A	Flux core solder, (60/40 tin/lead, type RMA)

TOOLS REQUIRED:

Straight-slot Screwdriver (#2)
Diagonal Cutters
Wire Strippers
HEYCO Pliers (#30)
Heat Gun
Wrench, box end (22mm)
Wrench, box end ($^{15}/_{16}$")
Solder Iron (35-45w)

CAUTION: This equipment contains parts sensitive to damage by ELECTROSTATIC DISCHARGE (ESD). Use ESD precautionary procedures when touching, removing or inserting.

WARNING: REMOVE THE AC POWER CORD PLUG FROM AC RECEPTACLE PRIOR TO PERFORMING THIS PROCEDURE. RESTORE AC POWER ONLY AS DIRECTED BY THIS PROCEDURE.

1.0 REMOVE CASE

1.1 Remove (2) 8-32 x 1 ¼" screws from pump handle.
1.2 Remove (4) 8-32 x $^{3}/_{16}$" screws and (4) external tooth star washers from bottom of case.
1.3 Remove finished case from chassis assembly.

1.4 Very carefully remove sealing bag from chassis, starting from bottom plate. Lift sealing bag to the top plate only.

2.0 DETACH POWER CORD ASSEMBLY

2.1 Open Main PCB and disconnect positive (red) battery wire from battery terminal.
2.2 Remove the HEYCO strain relief (Item 9) utilizing HEYCO pliers.
2.3 Remove the heat shrink covering the solder connection where the power cord's white wire is soldered to the transformer.
2.4 Desolder the power cord's white wire at the transformer.
2.5 Remove nut ($^{11}/_{32}$"), lock washer, ring terminal (connected to green wire) and star washer from the grounding stud on the inside of back panel.
2.6 Utilizing diagonal cutters, cut the power cord's remaining black wire approximately 3" from the AC fuse holder (6000+ Programmable), or where the power cord's black wire is secured to the fuse holder's red wire.
2.7 Pull the power cord assembly from the pump.
2.8 Inspect AC power cord for damage.
- 2.8.1 Verify no damage to outer insulation.
- 2.8.2 Verify no damage to inner conductors.
- 2.8.3 Verify green wire's (grounding) resistance is less than .1ohm.]

NOTE: Any power cord which is damaged should be replaced per SIGMA Field Service Bulletin 93-003.

3.0 INSTALL PIGTAIL STRAIN RELIEF RETROFIT KIT

3.1 Remove pigtail strain relief component parts from package and disassemble.
3.2 Slide pigtail (tapered end first) over the black, white and green wires until it is positioned over the power cord's outer jacket.
3.3 Slide coupler (collet end first) over the black, white and green wires until it is positioned over the power cord's outer jacket.
3.4 Slide the nylon washer over the black, white and green wires until it is positioned over the power cord's outer jacket.
3.5 Install the power cord through the oval opening in the back panel.
3.6 Slide the locking nut over the black, white and green wires so that the round flat surfaces face the back panel.
3.7 Route the black, white and green power cord wires between the battery and the back panel.
CAUTION: AC wires must be routed away from the DC circuits on the Main PCB assembly in order to prevent interference from electromagnetic fields.
3.8 Secure black AC wire.
- 3.8.1 Strip $^{3}/_{8}$" of the insulation, twist and tin the existing wire from the AC fuse holder.
- 3.8.2 Place two pieces of clear $^{3}/_{16}$" x ¾" long heat shrink over the black power cord wire.

  NOTE: Mechanically secure both wires prior to soldering.
- 3.8.3 Bend loops in the tinned areas of both black wires, hook together and solder.
- 3.8.4 Center the first piece of heat shrink over the solder connection and shrink with heat gun.
- 3.8.5 Center the second piece of heat shrink over the solder connection and shrink with heat gun.

3.9 Secure the white AC wire.
- 3.9.1 Place one piece of clear $^{3}/_{16}$" x ¾" long heat shrink over the white power cord wire.
- 3.9.2 Bend a loop in the tinned area of the white wire.

3.9.3 Insert the hook of the white wire into the vacant loop on the left side of the transformer and solder.

3.9.4 Slide the heat shrink over the solder connection and shrink with a heat gun.

3.10 Secure the green AC wire (grounding)

NOTE: Make sure the green wire has a minimum of one inch more slack than the black and white wires when secured.

3.10.1 Place star washer on ground stud on the back panel.

3.10.2 Place the ring terminal (connected to the green AC wire) on the stud.

3.10.3 Place the second lock washer on the stud over the ring terminal.

3.10.4 Place the $^{11}/_{32}$" nut on the stud and tighten.

3.11 Assemble the pigtail strain relief.

3.11.1 Position the power cord so that ¼" of the insulating jacket extends inward from the back panel.

NOTE: The previous step should remove most of the slack on the power cord internal of the pump.

3.11.2 Position the strain relief coupler through the nylon washer and through the oval opening on the back panel.

3.11.3 Center the coupler in the back panel's oval shaped hole. Firmly secure the coupler with the locking nut. Position the locking nut so that one of the wrench flats are parallel to the back panel and secure. This will allow the Main PCB to clear when closed.

3.11.4 Firmly secure the pigtail to the collet end of the coupler.

4.0 REASSEMBLE PUMP

4.1 Check for loose or foreign objects within the unit.

4.2 Connect the battery, tuck harness wire correctly (away from pump assembly and AC voltage wires) then close Main PCB.

4.3 Align openings in chassis sticker in the standoffs in the top plate and press down. Pull sides of the sticker down sides of the chassis, align with edge of back and front panels, press down and fold the rest of sticker on to bottom plate.

NOTE: Replace the chassis sticker if damaged or if it appears that is may not prevent fluid intrusion.

4.4 Place finished case over sub-assembly final. Align the holes in case with the standoffs in the top and bottom plates. Attach case with (4) 8-32 x $^{3}/_{16}$ and (4) external tooth star washers. Squeeze bottom of case together while tightening screws.

4.5 Attach handle to case with (2) 8-32 x 1 ¼ screws.

5.0 ELECTRICAL SAFETY CHECKS

5.1 Verify continuity from grounding terminal of plug to pump chassis.

5.2 Leakage measurements for:

5.2.1 Grounded normal polarity

5.2.2 Lifted ground, normal polarity

5.2.3 Lifted ground, reverse polarity

SIGMA Specification is <15 micro amps.

6.0 OPERATIONAL CHECK

6.1 Check pump for proper AC operation.

6.2 Perform the SIGMA Preventative Maintenance inspection which is located in the Service Manual.

Field Service Bulletin FSB 93-006 – Kit P/N 85207 Installation Procedure (Power Cord Pigtail Strain Relief)

NOTE: Early issues of the SIGMA 6000 and 6000+ Service Manuals will not have the Preventative Maintenance Procedure. You may contact SIGMA for this publication by phoning 1-800-356-3454

7.0 TECHNICAL ASSITANCE

7.1 For technical assistance, please call the SIGMA Service Manager at 1-800-356-3454.

Field Service Bulletin FSB 94-001 – Drop Sensor Jack Assembly Installation Procedure

PURPOSE: This procedure is intended to provide the User Facilities with a chronological sequence of steps required to install a Drop Sensor Jack Assembly (P/N 86263P) to J3 on the Main PCB Assembly.

SCOPE: The application of this procedure is limited to biomedical technicians who have satisfactorily completed the SIGMA 2-day or 5-day Service School training class. The drop sensor jack assembly shall be replaced whenever malfunctioning, damaged or corroded. SIGMA Standard Operating Procedures (SOP) shall supersede any applicable step of this procedure.

REFERENCE MATERIAL:

SIGMA Service Manual 6000
SIGMA Service Manual 6000+
SIGMA Service Manual 6000+ Programmable
SIGMA 6000 IV Pump Preventative Maintenance

MATERIALS REQUIRED:

SIGMA P/N	Description
86263P	Drop Sensor Jack Assembly
86264P	Bezel
85219 (SE)	Key-in-Plug
SE	Loctite 414 (or equivalent)

TOOLS REQUIRED:

Straight-slot Screwdriver (#2)

CAUTION: This equipment contains parts sensitive to damage by ELECTROSTATIC DISCHARGE (ESD). Use ESD precautionary procedures when touching, removing and inserting.

WARNING: REMOVE THE AC POWER CORD PLUG FROM AC RECEPTACLE PRIOR TO PERFORMING THIS PROCEDURE. RESTORE AC POWER ONLY AS DIRECTED BY THIS PROCEDURE.

1.0 REMOVE CASE

1.1 Remove (2) 8-32 x 1 ¼" screws from pump handle.
1.2 Remove (4) 8-32 x $^{3}/_{16}$" screws and (4) external tooth star washers from bottom of case.
1.3 Remove finished case from chassis assembly.
1.4 Very carefully lift chassis sticker (sealing bag) from chassis on the Main PCB side only. Starting from bottom plate, and lift chassis sticker to the top plate only.

2.0 REMOVE DROP SENSOR JACK ASSEMBLY

2.1 Open Main PCB and disconnect positive (red) battery wire from battery terminal.
2.2 Remove bezel (retainer which secures the drop sensor jack to the pumps back panel).
2.3 Remove AMP connector from J3 on the Main PCB.
2.4 Discard malfunctioning / damaged drop sensor jack assembly and bezel.

Field Service Bulletin FSB 94-001 – Drop Sensor Jack Assembly Installation Procedure (Continued)

3.0 INTALL REPLACEMENT DROP SENSOR JACK ASSEMBLY

NOTE: P/N 86263P now has a 6-pin AMP connector (blue) for the Main PCB termination. If J3 on the Main PCB is a 5-pin header, then you must install the key-in-plug into the socket #6 (bottom socket where no wire is connected) of the AMP connector before installation. This is required to ensure proper operation of the Flow Sensor (ie if not keyed the jack could be improperly connected to J3).

If keying the 6-pin AMP connector is required, insert the key-in-plug flush to the surface of the 6-pin AMP connector (blue) to ensure connector can be fully plugged into J3.

3.1 Place a small amount of Loctite 414 on both sides of the jack where the bezel tabs lock in, and also at the jack surface where the jack meets the inside of the back panel.

3.2 Insert jack into hole on the back panel (internal pins should be toward the bottom of the unit).

3.3 While holding the jack in the hole, place the bezel over the exterior portion of the jack. The inside tabs of the bezel must be vertical with the unit. Connect the bezel by pushing the left side down unit an audible click is heard. Then push the right side down until a second click occurs.

3.4 Plug the 6-pin AMP connector onto J3 on the Main PCB.

4.0 REASSEMBLE PUMP

4.1 Check for loose or foreign objects within the unit.

4.2 Connect the battery, tuck harness wire away from pump assembly and AC voltage wires, then close Main PCB.

4.3 Pull side of the chassis sticker down over the Main PCB, align with edge of back and front panels, press down and fold the rest of sticker on to bottom plate.

NOTE: Replace the chassis sticker if damaged or if it appears that it may not prevent fluid intrusion.

4.4 Place case over chassis. Align the holes in case with the standoffs in the top and bottom plates. Attach case with (4) 8-32 x $^{3}/_{16}$ and (4) external tooth star washers. Squeeze bottom of case together while tightening screws.

4.5 Attach handle to case with (2) 8-32 x 1 ¼ screws.

5.0 OPERATIONAL CHECK

5.1 Perform the SIGMA Preventative Maintenance Procedure

NOTE: Early issues of the SIGMA 6000 and 6000+ Service Manuals will not have the Preventative Maintenance Procedure. You may contact SIGMA for this publication by phoning 1-800-356-3454.

6.0 TECHNICAL ASSISTANCE

6.1 For technical assistance, please call the SIGMA Service Manager at 1-800-356-3454.

Field Service Bulletin FSB 94-002 – Battery Replacement Procedure

PURPOSE: This procedure is intended to provide the User Facilities with a chronological sequence of steps required to replace a battery (P/N 70012).

SCOPE: The application of this procedure is limited to biomedical technicians. Batteries shall be replaced when found to be malfunctioning (does not provide adequate battery operation duration per the Preventative Maintenance Procedure) or damaged. SIGMA Standard Operating Procedures (SOP) shall supersede any applicable step of this procedure.

REFERENCE MATERIAL:

SIGMA Service Manual 6000
SIGMA Service Manual 6000+
SIGMA Service Manual 6000+ Programmable
SIGMA 6000 IV Pump Preventative Maintenance

MATERIALS REQUIRED:

SIGMA P/N	Description
70012	Battery
SE *	Battery Tie
SE *	3M Double-Sided Tape
SE *	SCOTCH foam tape
85229	Battery terminal extension wire assembly
7447	Foot (Rubber Bumper)

TOOLS REQUIRED:

Straight-slot Screwdriver (#2)
Diagonal Cutters
Pliers
Heat Gun

CAUTION: This equipment contains parts sensitive to damage by ELECTROSTATIC DISCHARGE (ESD). Use ESD precautionary procedures when touching, removing or inserting.

WARNING: REMOVE THE AC POWER CORD PLUG FROM AC RECEPTACLE PRIOR TO PERFORMING THIS PROCEDURE. RESTORE AC POWER ONLY AS DIRECTED BY THIS PROCEDURE.

1.0 REMOVE CASE

1.1 Remove (2) 8-32 x 1 ¼" screws from pump handle.
1.2 Remove (4) 8-32 x $^{3}/_{16}$" screws and (4) external tooth star washers from bottom of case.
1.3 Remove finished case from chassis assembly.
1.4 Very carefully lift chassis sticker (sealing bag) from chassis on the Main PCB side only. Starting from bottom plate and lift chassis sticker to the top plate only.

2.0 REMOVE BATTERY

2.1 Open Main PCB; disconnect positive (red) and negative (black) battery wires from battery terminals.
2.2 Utilizing diagonal cutters cut and remove the battery tie strap.
2.3 Utilizing pliers unscrew the lower Main PCB clip standoff and remove internal tooth star washer.

2.4 Utilizing a #2 flat blade screwdriver, push the screwdriver blade between the battery and the bottom plate assembly approximately ½". With a twisting motion, release the double-sided tape adhesive (break the seal) securing the battery to the bottom plate assembly.

2.5 Remove battery by apply equal force to the top and bottom of the battery's backside.
NOTE: Use care when removing battery to not damage the line cord and drop sensor wires.

2.6 Remove remaining double-sided adhesive tape from the bottom plate assembly.

3.0 INSTALL REPLACEMENT BATTERY

NOTE: Batteries purchased from SIGMA should have attached: 3M double-sided adhesive tape (bottom), SCOTCH foam tape (top), rubber bumper P/N 7447 (side toward motor), a red extension wire P/N 85229 (on positive battery terminal) and a $^3/_8$" x 1" piece of heat shrink tubing (taped to front).

Not attached: Battery tie strap

Battery terminals are located on the battery's front surface near the top.

3.1 Remove outer layer of paper from the double-sided adhesive tape on the bottom of the battery.

3.2 Push the battery into place keeping battery terminals outward and at the top. Position the battery so that the back rests against the side support plate, the SCOTCH foam rests between the battery and the transformer and the rubber bumper faces the motor.

3.3 Tuck excess line cord wires between the battery and the back panel.

3.4 Install battery tie by inserting tie between the battery and back panel. Make sure there are no wires between the tie and battery. Insert tie through the rectangular opening at the rear of the side plate, then back through the top hole at the center of the side plate. Route tie between the battery and the motor (reference the "Chassis Assembly" drawing in the Service Manual). Secure the tie utilizing a tie rap gun or pliers. Cut excess tie material and discard.
NOTE: Pumps originally equipped with a SONNENSCHEIN battery will have a positive battery cable too short to reach the positive terminal of a YUASA battery. In this case, the Battery Terminal Extension Wire (P/N 85229) is required.

3.5 (If applicable) Install the battery terminal extension wire by connecting the male (blade) end into the female end of the positive (red) battery cable (from SC5 on the Main PCB). Slide the $^3/_8$" by 1" piece of heat shrink tubing over the two connectors so that an equal amount of each connector is visible. Secure the connectors by shrinking the tube with a hot air gun while making sure that the heat is not applied to other components, wires, etc…

3.6 Reinstall the internal star washer and screw on the lower main PCB clip standoff. Secure with pliers.

3.7 Connect the negative battery cable (black) from SC4 on the Main PCB to the negative (-) terminal on the battery.

3.8 Connect the positive battery cable (red) from SC5 on the Main PCB to the positive (+) terminal on the battery.

4.0 REASSEMBEL PUMP

4.1 Check for loose or foreign objects within the unit.

4.2 Tuck harness wires away from pump assembly and AC wires then close Main PCB.

4.3 Pull side of the chassis sticker down over the Main PCB, align with edge of back and front panels, press down and fold the rest of sticker on to bottom plate.
NOTE: Replace the chassis sticker if damaged or if it appears that it may not prevent fluid intrusion.

4.4 Place case over chassis. Align the holes in case with the standoffs in the top and bottom plates. Attach case with (4) 8-32 x $^{3}/_{16}$ screws and (4) external tooth star washers. Squeeze bottom of case together while tightening screws.

4.5 Attach handle to case with (2) 8-32 x 1 ¼ screws.

5.0 OPERATIONAL CHECK

5.1 Perform the SIGMA Preventative Maintenance Procedure.

NOTE: Early issues of the SIGMA 6000 and 6000+ Service Manual will not have the Preventative Maintenance Procedure. You may contact SIGMA for this publication by phoning 1-800-356-3454.

6.0 TECHNICAL ASSISTANCE

6.1 For technical assistance, please call the SIGMA Service Manager at 1-800-356-3454.

Field Service Bulletin FSB 95-001 – Battery Charge Voltage Adjustment

EFFECTIVITY:

The application of this procedure applies to pumps that have an ECN or PCN number less than 04295. The ECN/PCN number is indicated on the rear of the top plate assembly (seen with case removed) with a permanent marker. This procedure is not required if the calibration tag date (sticker located on the bottom of the case) is later than 11-15-95.

PURPOSE: This procedure is intended to provide the User Facilities with a chronological sequence of steps required to readjust the battery charge voltage from 13.8vdc to 13.6vdc (to maximize battery life).

SCOPE: The application of this procedure is limited to biomedical technicians. The battery charge voltage is being decreased based on the recommendation of the battery manufacturer. This adjustment should be made at the next preventative maintenance inspection, or at your earliest convenience. SIGMA Standard Operating Procedures (SOP) shall supersede any applicable step of this procedure.

REFRENCE PROCEDURES:

SIGMA 6000 IV Pump Preventative Maintenance (refer to the SIGMA 6000+ Programmable Service Manual or obtain by request at 1-800-356-3454)

REFERENCE DRAWINGS:

SIGMA DWG #	Description
86600 – 3	Final Assembly
86626	Assembly Chopper Main PCB
86011	Assembly LSI Main PCB

MATERIALS REQUIRED:

SIGMA P/N	Description
N/A	Assure (Loctite #425 or equivalent)

TOOLS REQUIRED:

Straight-slot Screwdriver
Digital Volt Meter (DVM) (range 20vdc, 4-digits, ± 1%)
Trimpot Adjustment Tool

CAUTION: This equipment contains parts sensitive to damage by ELECTROSTATIC DISCHARGE (ESD). Use ESD precautionary procedures when touching, removing or inserting.

WARNING: Remove AC power and re-apply only as directed by this procedure.

1.0 REMOVE CASE (Refer to DWG 86600 – 3)

1.1 Remove AC power (unplug)
1.2 Remove (2) 8-32 x 1 ¼" screws (Item 12) from pump handle (Item 8).
1.3 Remove (4) 8-32 x $^{3}/_{16}$" screws (Item 10) and (4) external tooth star washers (Item 11) from bottom of case.
1.4 Remove finished case (Item 7) from chassis assembly.

1.5 Very carefully remove the chassis sticker (sealing bag) (Item 5) from chassis starting from the bottom plate on the Main PCB side. Peal bag up to the top plate assembly only.

1.6 Open the Main PCB and disconnect the positive (red) battery wire from the battery terminal.

2.0 IDENTIFY THE PUMP MODEL / CONFIGURATION

NOTE: Identifying SIGMA LSI or Chopper Main PCB: Chopper Main PCB's are associated with a phone style Drop Sensor Jack located on the pump's back panel and LSI Main PCB's are not.

2.1 Proceed to step 3.0 if you have a:

- 2.1.1 SIGMA 6000 (5%, Chopper Main PCB)
- 2.1.2 SIGMA 6000+ Volumetric
- 2.1.3 SIGMA 6000+ Programmable
- 2.1.4 SIGMA 6000+ Export
- 2.1.5 MedSpec1

2.2 Proceed to step 4.0 if you have a:

- 2.2.1 SIGMA 6000 (10%, LSI Main PCB)

3.0 BATTERY CHARGE VOLTAGE ADJUSTMENT (CHOPPER MAIN PCB)

NOTE: Refer to DWG 86626 for component locations

3.1 Plug AC line cord into an outlet. Verify the AC indicator lamp is illuminated (model 6000's don't apply).

NOTE: Battery charge voltages must be calibrated while the microprocessor is **off** (axed mode). To achieve axed mode, access the TEST MODE then turn the pump off.

3.2 Turn R23 10 revolutions counterclockwise or until the potentiometer clicks (decrease voltage when power is applied).

3.3 Connect the DVM positive lead to the red (+) battery cable connector. Connect the DVM negative lead to chassis (ground).

3.4 Adjust R22 counterclockwise (decrease) until battery charge voltage equals +13.60vdc **(+.05 / -.00vdc)**. Disconnect DVM positive lead from the red (+) battery cable connector.

3.5 Secure R22 adjustment stem with Assure (Loctite #425 or equivalent).

3.6 Connect DVM positive lead to the cathode D11.

3.7 Adjust R23 **slowly** clockwise until DVM indicates +13.90vdc ± .05vdc. Disconnect DVM positive lead from the cathode of D11.

3.8 Remove AC power (unplug).

3.9 Secure R23 adjustment stem with Assure (Loctite #425 or equivalent).

3.10 Refer to section 5.0 to reassemble pump.

4.0 BATTERY CHARGE VOLTAGE ADJUSTMENT SIGMA 6000 (10% LSI MAIN PCB)

NOTE: Refer to DWG 86011 for component locations

4.1 Plug AC line cord into an outlet.

NOTE: Battery charge voltages must be calibrated while the microprocessor is **off** (axed mode). To achieve axed mode, access the TEST MODE then turn the pump off.

4.2 Turn R43 10 revolutions clockwise or until the potentiometer clicks (decrease voltage when power is applied).

4.3 Connect the DVM positive lead to the red (+) battery cable connector. Connect the DVM negative lead to chassis (ground).

4.4 Adjust R42 clockwise (decrease) until battery charge voltage equals +13.60vdc **(+.05 / -.00vdc)**. Disconnect DVM positive lead from the red (+) battery cable connector.

4.5 Secure R42 adjustment stem with Assure (Loctite #425 or equivalent).

4.6 Connect DVM positive lead to the cathode D21.

4.7 Adjust R43 **slowly** counterclockwise until DVM indicates +13.90vdc ± .05vdc. Disconnect DVM positive lead from the cathode of D21.

4.8 Remove AC power (unplug).
4.9 Secure R43 adjustment stem with Assure (Loctite #425 or equivalent).
4.10 Refer to section 5.0 to reassemble pump.

5.0 REASSEMBLE PUMP (Refer to DWG 86600 – 3)

5.1 Check for loose or foreign objects within the unit.
5.2 Reconnect positive (+) battery cable to positive battery terminal, tuck harness wire away from pump assembly and AC voltage wires then close Main PCB.
5.3 Align openings in chassis sticker with the standoffs in the top plate and press down. Pull sides of the sticker down sides of chassis, align with edge of back and front panels, press down and fold the rest of sticker on to bottom plate.
NOTE: Replace the chassis sticker if damaged or if it appears that it may not prevent fluid intrusion.
5.4 Place finished case (Item 7) over sub-assembly final. Align the holes in case with the standoffs in the top and bottom plates. Attach the case with (4) 8-32 x $^{3}/_{16}$ (Item 10) and (4) external tooth star washers (Item 11). Squeeze bottom of case together while tightening screws.
5.5 Attach handle (Item 8) to case with (2) 8-32 x 1 ¼ screws (Item 12).

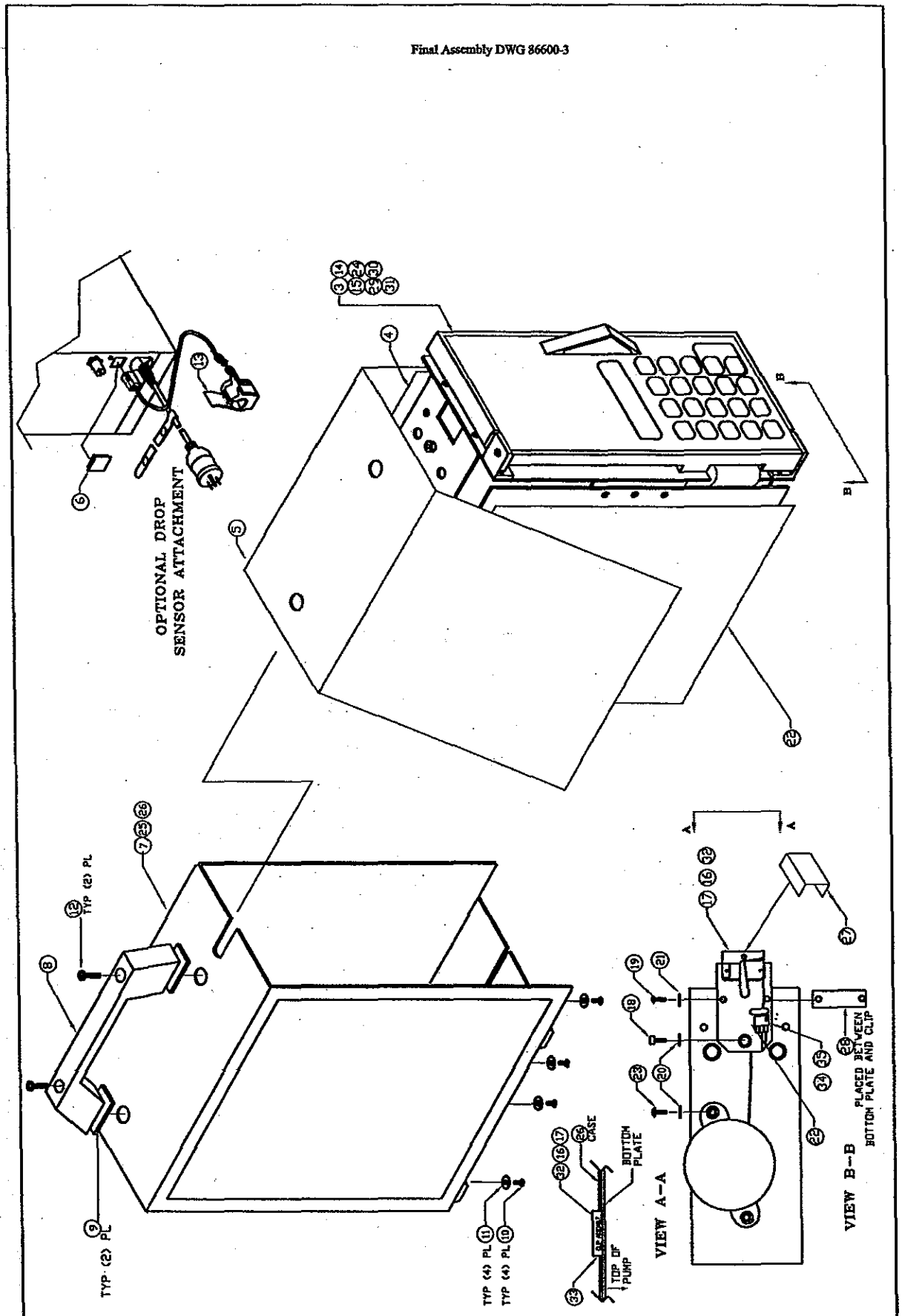
6.0 OPERATIONAL CHECK

6.1 Perform SIGMA's Preventative Maintenance inspection.

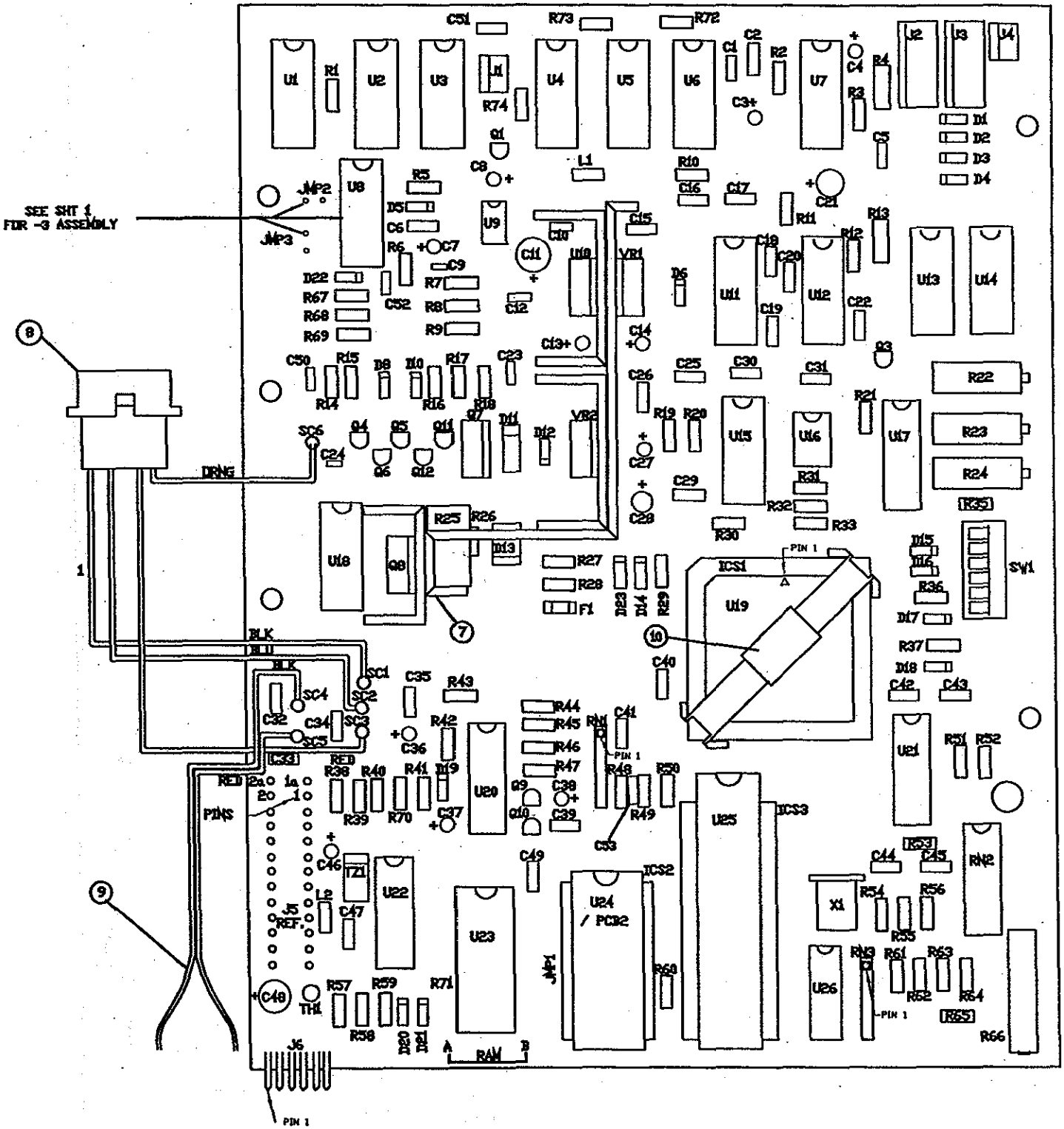
FACTORY ASSISTANCE:

For **technical assistance**, please call the SIGMA Service Manager at 1-800-356-3454.

For **Factory Service** you must obtain a Return Authorization Number (RA#) by calling the SIGMA Service Manager at 1-800-356-3454.


OPTIONAL DROP
SENSOR ATTACHMENT
TYP (2) PL
TYP (2) PL
TYP (4) PL
TYP (4) PL
TOP OF
PUMP
CASE
BOTTOM
PLATE
VIEW A-A
VIEW B-B
PLACED BETWEEN
BOTTOM PLATE AND CLIP

Main PCB Assembly w/Cables, DWG 86626-2



LSI Main PCB Assembly
DWG 86011